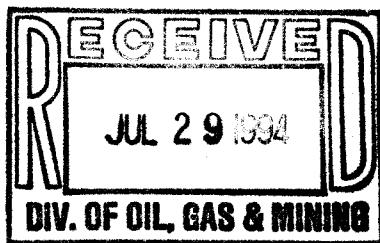


Kennecott
Utah Copper
P.O. Box 525
Bingham Canyon, Utah 84006-0525
(801) 569-6506

Frederick D. Fox
Director, Environmental Affairs

July 27, 1994



Kennecott

Ms. Lisa Rogers
Utah State Department of Environmental Health
Division of Water Quality
288 North 1460 West
P.O. Box 144870
Salt Lake City, Ut 84114-4870

Subject: Demonstration Project for the Application of Biosolids
in the Reclamation of the Tailings Impoundment

Dear Ms. Rogers:

Kennecott Utah Copper (KUC) has begun the initial stages of implementing the "Land Application of Municipal Biosolids" demonstration project as approved by the Department of Environmental Quality in a letter dated March 31, 1994. The purpose of this letter is to provide the information requested and to acknowledge the conditions set forth in the approval letter. This letter also serves to identify minor changes that are being made to the project.

With respect to items identified in your approval letter, the following information and comments are provided:

1. The proposed dry tonnage application rate for the sludge is given as 0 tons/acre (control), 10 dry tons/acre, 20 dry tons/acre, and 30 dry tons/acre. This translates to 0, 50, 100, 150 wet tons/acre. These amounts are well within the annual whole sludge application rate of 35.7 tons/acre computed from the CVWRF data (Ni was the limiting factor in these calculations). A total of approximately 1800 dry tons (9000 wet tons) will be applied during the project. The agronomic calculations are attached. The application rate is less than the 40 CFR 503 limits set for other constituents. Additionally, green waste will be applied at approximately 30 tons per acre to Test Cell No. 1 only. Green waste will be applied, and the sludge applied on top of the green waste. All applications will be disced to a depth of 12 inches.

The sludge will be sampled and tested by CVWRF in accordance with 40 CFR 503 regulations before it is delivered to the

tailings impoundment. However, the assumption has to be made that the sludge is satisfactory by 40 CFR 503 regulations, given the lag time between sampling and release of the test results. CVWRF will provide copies of the test results to Kennecott as soon as they are available, in addition to certifications that the delivered sludge has met 503 regulations.

KUC will utilize approximately 80 tons of wet sludge from the Magna Water District on Test Cell No. 4. Analyses of this sludge is also attached.

2. The attached calculations show that application rates will comply with 40 CFR 503. Kennecott will adhere to all of the provisions of the 503 site restrictions and management requirements.
3. Reports will be submitted to DWQ and DOGM in the fall of 1994, 1995, 1996, 1997, 1999, and 2004. The reports will contain the information requested.
4. Erosion control will be similar to the standard practice as previously implemented on the tailings impoundment, including dust control.
5. No ground water standards or TDS limits will be exceeded by this demonstration project.
6. No nutrient addition is anticipated.
7. The background soil sampling and analysis program prior to the application of biosolids is extensive. Samples for chemical testing will be collected to a total depth of 5 feet from four locations in each test cell. Sample locations will be the centers of the plots which will receive 30 dry tons of sludge per acre. Samples will be collected at depths of 0 to 6, 6 to 12, 30 to 36, and 54 to 60 inches. They will be analyzed for pH, organic matter, and the ten metals required by 40 CFR 503. Additionally, testing for agronomic properties and metals will be performed on composite samples collected from the top 6 inches of the soils. These samples will be composited by plot treatment. Thus, each plot in the study will be sampled, with four composite samples from each test cell. Each of the composite samples will be split into two parts. One part will be tested for argonomic levels. The other part will be analyzed for metals content. That means the

total number of samples to be collected and tested from each of the 6 test cells is:

- 16 discrete samples to be metals tested : one sample from each of the plots to receive 30 dry tons/acre for each of the depths 0, 1, 3, and 5 feet
- 4 composite samples to be metals tested: from 0 to 6 inches from each plot, composited by treatment.
- 4 composite samples for argonomic testing: from 0 to 6 inches from each plot, composited by treatment.

Total = 24 baseline soil samples per test cell

Changes have been made to the demonstration program since the application was first submitted. These changes include:

- Test cell locations and sizes have been rearranged due to other activities on the tailings impoundment.
- Three biosolids application rates will be used instead of two. The additional treatment will provide comparative data and more information on the interaction of soil, biosolids, and vegetation.
- Sampling depth intervals have been changed; see above. Only some of the samples will be composited. These changes facilitate efficient sampling.
- The number of soil samples, both for baseline and post-application data collection, has been increased. This will improve understanding and control of soil composition.
- Lime will be applied at the rate of 3 tons/acre to test cell number 3 before biosolids are applied. This will provide information about using lime as a neutralizing agent if that is necessary in the future.
- Vegetation sampling will be done by treatment plot rather than by 5 acre transect.
- The samples will be chemically tested by the Kennecott Environmental Laboratory, or analyzed for agronomic levels by the Utah State University Laboratory.
- The date of the first application will be in the Autumn of 1994, not in the spring of 1994.

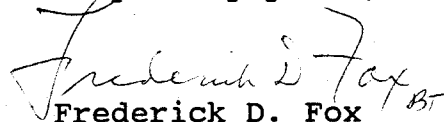
Ms. Lisa Rogers
July 27, 1994
Page 4

- The soil tests will be not be done quarterly during the first year after application. Baseline samples will be collected before application of the sludge. Then samples will be collected in the fall of 1994 after sludge has been applied. Samples will be collected again in the summer of 1995, 1996, 1997, 1999, and 2004.

None of these changes will adversely affect the outcome of the project, but rather will result in an improvement in the project design. Please provide any comments, concerns and/or recommendations that you may have concerning these changes.

Provided that your concurrence is given, it is anticipated that the actual application of sludge will begin by the second week of August, 1994. Comments or any requests for more information should be directed to Richard Jones at 569-6640.

Very truly yours,


Frederick D. Fox BT

FDF\AM:bt

Enclosure

cc: D. Wayne Hedberg, DOGM
Bob Brobst, EPA Region VIII
Melvin Muir, Salt Lake City/County Health Dept.
Kiran Bhayani, Manager, Design Evaluation Section, UDWQ
Larry Mize, Manager, Ground Water Protection section, UDWQ
Paul Krauth, DWQ
James Carter, Director, DOGM

Attachments

1. Example: CVWRF sludge analyses
2. Example: Magna Imp. Dist. Wastewater Plant sludge analysis
3. Agronomic Calculations
4. Map: Overview of Tailings Impoundment with test cells marked.

Attachment 1. Example: CVWRF sludge analyses



CENTRAL VALLEY WATER RECLAMATION LABORATORY
CERTIFICATE OF ANALYSIS

Attn: Ron Roberts
CVWRF
Engineering Department
800 West Central Valley Road
Salt Lake City UT 84119

Report Date: 12/20/93

Laboratory #: 93110612
Sample ID: BFP CAKE
Location: C.V.-BFP CAKE
Comment:

Sample Date: 11/29/93
Time: 11:35:00
By: A.DAW

Parameter	Result Units
Fecal Coliform	98266 gDWB
Ammonia Nitrogen	9928.32 mg/Kg
Nitrite	7.15 mg/Kg
Nitrate	3.90 mg/Kg
Phosphorus, Total	7471.10 mg/L
Total Kjeldahl Nitrogen	51685.90 mg/Kg
Total Solids	17.27 %
Volatile Solids	63.28 %

Respectfully submitted,

Anthony G. Daw
Laboratory Director



CENTRAL VALLEY WATER RECLAMATION LABORATORY
CERTIFICATE OF ANALYSIS

Attn: Ron Roberts
CVWRF
Engineering Department
800 West Central Valley Road
Salt Lake City UT 84119

Report Date: 12/09/93

Laboratory #: 93110403
Sample ID: BFP CAKE
Location: BFP CAKE
Comment:

Sample Date: 11/19/93
Time: 11:50:00
By: A.DAW

Parameter	Result Units
Fecal Coliform	666667 gDWB
Ammonia Nitrogen	11276.48 mg/Kg
Nitrite	7.27 mg/Kg
Nitrate	1.52 mg/Kg
Phosphorus, Total	10636.36 mg/L
Total Kjeldahl Nitrogen	52296.97 mg/Kg
Total Solids	17.56 %
Volatile Solids	64.39 %

Respectfully submitted,

Anthony G. Daw
Laboratory Director

11/04/94 14

Report No. 11

03-Jan-94 00:00:00

31-Mar-94 00:00:00

DRY BELT FILTER PRESS CAKE HEAVY METAL DATA
BPPCONH

date	Al	Ag	Au	Ba	B	Cd	Co	Cr	Cu	Fe	Hg	K	Mn	Mo	Ni	Pb	Sb	Se	Sn	Ti	Tl	Va	Zn	Zr
Jan/94		136.3	10.5	742.9	24.0	3.4	38.0	38.0	547.4		4.8		242.9	106.2	72.0	122.3		34.8	948.4			14.9	1051.4	
Jan/94		85.8	2.0	706.9	18.4	5.7	47.1	47.1	511.0		3.1		229.3	95.2	44.8	19.5		27.7	747.0			20.1	839.0	
Jan/94		99.0	0.4	806.4	34.2	7.5	89.4	89.4	Under Range		0.0		318.2	49.2	282.2	137.3		30.7	12713.3			21.8	1211.1	
Jan/94		70.5	3.0	887.7	30.5	6.4	48.5	48.5	447.0		0.5		183.0	46.0	34.4	91.9		23.0	8039.4			14.0	784.6	
Jan/94		51.4	1.9	920.1	87.4	5.7	49.7	49.7	688.6		8.3		284.0	84.0	57.8	153.1		40.0	7885.3			21.1	942.8	
Feb/94		85.1	2.2	840.0	42.3	3.4	44.0	44.0	549.1		2.7		248.0	53.2	45.1	183.4		53.9	8913.7			10.0	888.0	
Feb/94		90.4	1.4	903.7	42.8	5.9	48.0	48.0	577.5		4.2		239.4	55.1	50.7	148.7		57.5	7380.2			17.7	791.4	
Feb/94		73.1	2.8	884.7	37.9	6.8	61.0	61.0	820.8		3.8		242.9	57.2	70.9	152.7		34.6	11318.8			20.3	1065.9	
Mar/94		79.6	2.9	948.2	55.1	4.2	58.9	58.9	882.8		2.8		270.7	81.7	65.8	32.3		38.9	11796.2			21.8	910.1	
Mar/94		109.1	5.3	948.4	66.1	7.9	89.7	89.7	938.4		5.1		248.7	55.7	80.7	188.5		28.9	11890.8			19.4	1000.0	
Mar/94		91.1	7.2	843.8	19.8	8.8	89.3	89.3	848.7		2.4		227.1	80.4	88.0	141.7		28.2	14114.1			15.6	1082.4	
Mar/94		87.8	5.7	858.5	30.8	8.1	78.7	78.7	936.2		3.2		209.7	Under Ra	82.9	141.5		31.3	15182.2			17.1	1018.3	
Mar/94		83.9	6.1	882.8	66.9	8.4	82.0	82.0	911.4		4.8		193.4	80.2	76.5	112.1		21.9	10059.7			18.1	1006.0	
		88.2	4.3	817.1	40.0	5.8	55.7	55.7	974.5		3.5		203.3	84.2	76.1	121.2		35.9	8999.8			18.2	948.9	
		138.3	10.5	948.2	87.4	8.4	78.7	78.7	882.8		8.3		638.2	106.2	202.2	188.5		57.5	15182.2			21.8	1211.1	
		51.4	1.4	858.5	10.4	3.4	38.0	38.0	447.0		0.4		183.0	46.0	34.4	19.5		21.9	747.0			14.0	784.6	



CENTRAL VALLEY WATER RECLAMATION LABORATORY
CERTIFICATE OF ANALYSIS

Attachment 5

Attn: Gordon Beals
CVWRF
Operations Department
800 W. Central Valley Road
South Salt Lake UT 84119

Report Date: 05/01/93

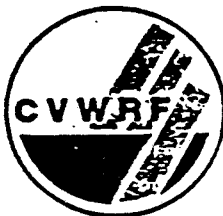
Laboratory #: 93103596
Sample ID: BFP Cake Wet Weight
Location:
Comment:

Sample Date: 04/27/93
Time: 16:00:00
By: PAUL

Parameter	Result	Units
1,1,1-Trichloroethane	<	2.0 ppb
1,1,2,2-Tetrachloroethane	<	2.0 ppb
1,1,2-Trichloroethane	<	2.0 ppb
1,1-Dichloroethane	<	2.0 ppb
1,1-Dichloroethene	<	2.0 ppb
1,2 Dichloroethane	<	2.0 ppb
1,2-Dichlorobenzene	<	2.0 ppb
1,2-Dichloropropane	<	2.0 ppb
1,3-Dichlorobenzene	<	2.0 ppb
1,4-Dichlorobenzene	<	2.0 ppb
2-Chloroethylvinyl ether	<	10.0 ppb
Acetone		35.9 ppb
Bromodichloromethane	<	2.0 ppb
Benzene	<	2.0 ppb
Bromomethane	<	10.0 ppb
Bromoform	<	5.0 ppb
cis-1,3,-Dichloropropene	<	2.0 ppb
Carbon tetrachloride	<	2.0 ppb
Chlorobenzene	<	2.0 ppb
Chloroethane	<	2.0 ppb
Chloromethane	<	5.0 ppb
Chloroform	<	2.0 ppb
Dibromochloromethane	<	2.0 ppb
Ethylbenzene		2.6 ppb
Freon	<	2.0 ppb
Methylethyl ketone		10.7 ppb
Methylene chloride	<	2.0 ppb
Methylisobutyl ketone	<	2.0 ppb
m,p-Xylene		4.6 ppb
o-Xylene		7.3 ppb
trans-1,2-Dichloroethene	<	2.0 ppb
trans-1,3-Dichloropropene	<	2.0 ppb
Trichlorofluoromethane	<	5.0 ppb
Tetrachloroethene	<	2.0 ppb
Toluene		6.5 ppb
Trichloroethene	<	2.0 ppb
Vinyl chloride	<	2.0 ppb

Respectfully submitted,

Anthony G. Daw
Laboratory Director



CENTRAL VALLEY WATER RECLAMATION LABORATORY
CERTIFICATE OF ANALYSIS

Attn: Gordon Beals
CVWRF
Operations Department
800 W. Central Valley Road
South Salt Lake UT 84119

Report Date: 05/19/93

Laboratory #: 93103825
Sample ID: BFP Cake Wet Weight
Location:
Comment:

Sample Date: 05/03/93
Time: 12:00:00
By: PAUL

Parameter		Result Units
1,1,1-Trichloroethane	<	2.0 ppb
1,1,2,2-Tetrachloroethane	<	2.0 ppb
1,1,2-Trichloroethane	<	2.0 ppb
1,1-Dichloroethane	<	2.0 ppb
1,1-Dichloroethene	<	2.0 ppb
1,2 Dichloroethane	<	2.0 ppb
1,2-Dichlorobenzene		8.8 ppb
1,2-Dichloropropane	<	2.0 ppb
1,3-Dichlorobenzene	<	2.0 ppb
1,4-Dichlorobenzene	<	2.0 ppb
2-Chloroethylvinyl ether	<	10.0 ppb
Acetone		8.3 ppb
Bromodichloromethane	<	2.0 ppb
Benzene		285.0 ppb
Bromomethane	<	10.0 ppb
Bromoform	<	5.0 ppb
cis-1,3,-Dichloropropene	<	2.0 ppb
Carbon tetrachloride	<	2.0 ppb
Chlorobenzene	<	2.0 ppb
Chloroethane	<	2.0 ppb
Chloromethane	<	5.0 ppb
Chloroform	<	2.0 ppb
Dibromochloromethane		35.4 ppb
Ethylbenzene	<	2.0 ppb
Freon	<	2.0 ppb
Methylethyl ketone	<	2.0 ppb
Methylene chloride	<	2.0 ppb
Methylisobutyl ketone	<	2.0 ppb
m,p-Xylene		2.1 ppb
o-Xylene		2.9 ppb
trans-1,2-Dichloroethene	<	2.0 ppb
trans-1,3-Dichloropropene	<	2.0 ppb
Trichlorofluoromethane	<	5.0 ppb
Tetrachloroethene	<	2.0 ppb
Toluene	<	2.0 ppb
Trichloroethene	<	2.0 ppb
Vinyl chloride	<	2.0 ppb

Respectfully submitted,

Anthony G. Daw
Laboratory Director



CENTRAL VALLEY WATER RECLAMATION LABORATORY
CERTIFICATE OF ANALYSIS

Attn: Ron Roberts
CVWRF
Engineering Department
800 West Central Valley Road
Salt Lake City UT 84119


Report Date: 04/05/93

Laboratory #: 93102492
Sample ID: DRY CAKE NET WEIGHT
Location: TCLP EXTRACTION
Comment:

Sample Date: 03/23/93
Time: 10:18:00
By: HANS

Parameter	Result	Units
Arsenic	0.015	ppm
Barium	0.100	ppm
Boron	1.68	ppm
Cadmium	0.005	ppm
Chromium	0.010	ppm
Copper	0.035	ppm
Mercury	0.0002	ppm
Molybdenum	0.01	ppm
Nickel	0.087	ppm
Lead	0.005	ppm
Selenium	0.062	ppm
Zinc	0.135	ppm

Respectfully submitted,


Anthony G. Daw
Laboratory Director



CENTRAL VALLEY WATER RECLAMATION LABORATORY
CERTIFICATE OF ANALYSIS

Report Date: 10/18/93

Attn: Ron Roberts
CVWRF
Engineering Department
800 West Central Valley Road
Salt Lake City UT 84119

Laboratory #: 93108284
Sample ID: COMPOST FILE
Location: COMPOST FILE
Comment:

Sample Date: 09/21/93
Time: 10:30:00
By: RON ROBERT

Parameter	Result Units
Arsenic	4.957 ppm
Cadmium	1.743 ppm
Chromium	17.771 ppm
Copper	148.571 ppm
Mercury	0.8400 ppm
Molybdenum	11.914 ppm
Ammonia Nitrogen	559.50 mg/L
Nickel	18.057 ppm
Nitrate	3.58 mg/l
Lead	217.000 ppm
Selenium	2.143 ppm
Total Kjeldahl Nitrogen	12120.30 mg/L
Zinc	300.000 ppm

Respectfully submitted,

Anthony G. Daw
Laboratory Director



CENTRAL VALLEY WATER RECLAMATION LABORATORY
CERTIFICATE OF ANALYSIS

Attn: Gordon Beals
CVWRF
Operations Department
800 W. Central Valley Road
South Salt Lake UT 84119

Report Date: 09/29/93

Laboratory #: 93108223
Sample ID: BFP Cake Wet Weight
Location:
Comment:

Sample Date: 09/20/93
Time: 14:00:00
By: PAUL

Parameter	Result Units
Phosphorus, Total	2350.50 mg/L
Total Kjeldahl Nitrogen	9859.36 mg/L

Respectfully submitted,

Anthony G. Daw
Laboratory Director

Attachment 2. Example: Magna Imp. District
Wastewater Plant sludge analysis

FORD ANALYTICAL LABORATORIES

CHEMICAL AND BACTERIOLOGICAL ANALYSIS

DATE: 05/27/94 CERTIFICATE OF ANALYSIS

MAGNA IMP. DISTRICT
WASTEWATER PLANT
P.O. BOX 303
MAGNA, UT 84044

94-045010

SAMPLE: SLUDGE SAMPLE COLLECTED 5-12-94 RECEIVED 5-13-94 FOR ANALYSIS.

	Results	Method Detection Limit

- DRY WEIGHT BASIS	<i>Limits</i>	
Arsenic As mg/kg EPA 6010	75 7.35	1.00
Cadmium Cd mg/kg EPA 6010	85 8.7	1.0
Chromium Cr mg/kg EPA 6010	3000 34.3	1.0
Copper Cu mg/kg EPA 6010	4,300 713	1.00
Fecal Coliform/gram	3,000,000 <4000	
Lead Pb mg/kg EPA 6010	840 97	1.00
Mercury Hg mg/kg EPA 7471	57 5.3	.05
Molybdenum Mo mg/kg EPA 6010	75 21.4	1.0
Nickel Ni mg/kg EPA 6010	420 24.1	1.00
Selenium Se mg/kg EPA 6010	100 11.3	1.000
Total Solids % SM 2540 G	- 24.3	.05
Zinc Zn mg/kg EPA 6010	7,500 817	1.0

Paul W. Kwan
FORD ANALYTICAL LABORATORIES

- * ND - None Detected Above Specified Detection Limit *
- Metals analysis performed at Chemtech.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Attachment 3. Agronomic Calculation

The following abbreviations and sources are used in the calculations:

APLR = Annual Pollutant Loading Rates. This is from table 4 in 40 CFR 503.13.

AVE. = average values, ppm, from CVWRF Report No. 11, 3/JAN/94 to 31/MAR/94

(MAX) = maximum values, ppm, from CVWRF Report No. 11.

AWSAR = Annual Whole Sludge Application Rate. This is calculated with units of million tons/ hectare/ 365 days.

Crop = vegetation for which calculations are done = dryland wheat or grain. This is from "Utah Fertilizer Guide: (EC 431)

AWSAR

Biosolids Project

McNearney

Annual Whole Sludge Application Rate

DATA: Pollutant concentrations from CVWRF (dry belt filter press cake), Report No. 11, 3/JAN/94 to 31/MAR/94 - average values as PPM - (MAX)

	APLR (Table 4)			AVE. (MAX)		AWSAR (mT/ha/365 day)		(s ton/acre)	
As	1.9	+	4.3	(10.5)✓	x 1000 =	441.9	(180.9)	197.1	(80.7)
Cd	1.9	÷	5.6	(8.4)✓	" =	339.3	(226.2)	151.3	(100.9)
Cr	150	÷	55.7	(78.7)✓	" =	2,269.0	(1,906.0)	1,012.0	(850.1)
Cu	75	+	574.5	(682.6)✓	" =	130.6	(109.9)	58.3	(49.0)
Pb	15	+	121.2	(168.5)✓	" =	123.8	(89.0)	55.2	(39.7)
Hg	0.85	+	3.5	(8.3)✓	" =	242.9	(102.1)	108.3	(45.5)
Mo	0.90	÷	64.2	(106.2)*	" =	14.2	(8.47)	6.3	(3.8)
Ni	21	+	76.1	(262.2)✓	" =	275.9	(80.1)	123.1	(35.7)
Se	5.0	+	35.9	(57.5)✓	" =	139.3	(87.0)	62.1	(38.8)
Zn	140	+	948.9	(1,211.1)✓	" =	147.5	(115.6)	65.8	(51.6)

✓ = meets Table 1&3, * = exceeds Table 1&3, but Mo is not considered (75 ppm)

✓ Based on AWSAR, do not exceed 35.7 s ton/acre/year

Agronomic Rate for (N)

$K_v = 1.0$ (dewatered sludge) - anaerobically digested

Sludge

% solids = 17.42%	(ave. 11/19/93 & 11/29/93, BFP cake)		
TKN = 51,991.4 mg/Kg	"	"	
NH ₄ -N = 10,602.4 mg/Kg	"	"	10.6 Kg/mt
NO ₃ -N = 2.71 mg/Kg	"	"	0.003 Kg/mt
ORGANIC = 411,389.0 mg/Kg	"	"	41.4 Kg/mt

Soil

pH = 2.7-8.0, but generally around 7.6 optimum 6.0-7.5
 CEC = No Data
 Residual N = 2-5 call it 3 mg/Kg = 0.003 kg/mt

Crop

80 lb/acre - N from "Utah Fertilizer Guide" (EC 431)
Dryland wheat or grain 70-90 lb/acre

Organic Rate

1. a. $\text{NH}_4^+\text{-N}$ (kg/mt x K_v) = 10.6 kg/mt x 1.0 = 10.6 kg/mt
- b. Org-N x $F_{0.1}$ = 41.4 x 0.20 = 8.3 kg/mt
- c. $\text{NO}_3\text{-N}$ = 0.003 kg/mt
- d. Total Available = 18.9 kg/mt
2. a. Background N in soil = 0.003 kg/mt
3. Nitrogen from other sources = 0 kg/mt
4. Total N from existing sources = 0 kg/mt
5. N crop requirement (80 #/acre) = 89.7 kg/ha
6. Supplementary N needed from sewage sludge = 89.7 kg/ha
7. Agronomic Loading Rate (89.7/18.9) = 4.8 mt/ha or 2.1 tons/acre using dryland grain as the crop

Attachment 4. Map: Overview of Tailings Impoundment

